REMARKS

Claims 27, 30, 34, 35, 36 and 37 have been amended in order to correct a typographical error that occurred in the preliminary amendment. Support for the correction can be found on page 7, lines 16-20 of applicants' specification. Additionally, claim 19 has been amended. Support for newly added claims 38 and 39 can be found on page 6, lines 16-25 and on page 15, lines 23-24.

Claims 19-37 have been rejected under 35 USC §103(a) as unpatentable over Porubcan (3,897,307). The examiner argues that Porubcan teaches dried Lactobacillus with a carrier to form tablets and that the specific proportions and amounts of the ingredients used in the claimed composition and method are result effective variables that would be routinely optimized by one of ordinary skill in the art in practicing the invention disclosed in the references.

Applicants are convinced that the examiner has failed to establish a *prima facie* case of obviousness with respect to the instant invention. Three requirements must be fulfilled in order for a *prima facie* case of obviousness to be satisfied. First, there must be some suggestion or motivation in the references themselves or available to one of ordinary skill in the art to modify the reference or to combine reference teachings.[1] Second, there must be a reasonable expectation of success. Third, the prior art references combined must teach or suggest all the claim limitations. MPEP §2143.

[1]There are three possible sources for motivation to combine references: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 USPQ2d 1453, 1457-1458 (Fed. Cir. 1988).

Both the suggestion to carry out the claimed process and the reasonable expectation of success must be found in the prior art and not based on the applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). With respect to the instant application the examiner has failed to meet this burden.

Porubcan does not suggest concentrated, compressed, dry microorganism cultures of the instant invention. Porubcan does discuss the production of tablets of stabilized dry concentrates, wherein the dried material can be mixed with tableting sugar such as lactose or sucrose as a binder. (Column 7, lines 66-69 and Column 8, lines 1-3). However, mere tableting of the powder including sugar would not suggest to one of ordinary skill in the art the compression of the instant invention. In fact, this disclosure suggests the opposite of the examiner's argument. One of ordinary skill in the art would conclude that mixing 5-10 parts by weight of the stabilized dried fermentation solids containing the cell concentrate mixed with 90-95 parts of tableting sugar resulting in the dilution of the concentrate. Thus, resulting in a reduction of the cfu value. Additionally, one of ordinary skill in the art would recognize that the tableting process automatically causes an activity loss resulting in further reduction of the CFU value. Accordingly, the Porubcan reference fails to suggest applicants invention.

As one of ordinary skill in the art would recognize that the tableting of the concentrate would result in dilution of the concentrate and a reduction in cfu, there is no expectation of success of one of ordinary skill in the art.

In this instance the Porubcan reference does not teach or suggest all of the

claim limitations. While, the reference discloses methods of preparing dried microorganism cultures, it does not refer to the problems associated with preparing compressed microorganism cultures having an improved content of living microorganism. Specifically, the reference does not disclose the compression of microorganisms, nor does it disclose the additional measures needed in order to improve the cfu-value of compressed microorganism cultures that improve the survival rate of the microorganism. While Porubcan does disclose tableting, one of ordinary skill would recognize this as a dilution of the concentrate, not compression as in applicants invention. Additionally, the reference does not disclose the limitation of a specifically conditioned gas for performing the spray-drying process of a dew point of less than about +5°C. This result is not easily attained as non-conditioned air of the temperature of 20°C and 50% humidity has a dew point of +14°C and non-conditioned air of 25°C and relative humidity of 80% shows a dew point of +22°C. Accordingly, despite the relatively high drying temperatures, the survival rate for the dry preparation of the instant invention is 75% ± 25%.

Alternatively, even if a *prima facie* case of obviousness has been met the instant invention provides an unexpected improvement. Proof of an unexpected improvement may rebut a *prima facie* case of obviousness. *In re Murch*, 464 F.2d 1051, 175 USPQ 89 (CCPA 1972). Indeed, it is always error to exclude evidence of secondary indicators. *Stratoflex* v. *Aeroquip Corp.*, 713 F.2d 1540, 218 USPQ 871 (Fed. Cir. 1983). Applicants invention discloses preparing dry microorganism cultures which are

not only characterized by an improved content of viable microorganism but also are characterized by improved storage ability.

As previously discussed, the compression step for dry microorganism preparations has not previously been disclosed. The compression can be performed by compacting the pulverulent under linear forces in conventional compacting apparatuses in the range from about 5 to about 25 kN/cm, preferably from about 10 to about 15 kN/cm. (Page 4, lines 20-26). Additionally, the preliminary product can be tableted under the action of pressures in conventional tableting presses or may be obtained by spray-drying. (Page 4, lines 27-32). This results in a simplified process for the production of the microorganism cultures.

Surprisingly, the compression of the pulverulent preliminary product virtually does not impair product quality with respect to the number of viable microbes. This is evidenced in Table A which discloses four different microorganism preparations produced according to the present invention. The starting materials and compressed product have been analyzed in order to determine their cfu values. The results of the experiment are contained in Table B. As you can see these experiments resulted in initial powder concentrations of $1.47 \cdot 10^{11}$ cfu/g to $1.63 \cdot 10^{11}$ cfu/g and compressed product in the range of from $.7 \cdot 10^{11}$/g to $1.17 \cdot 10^{11}$/g. This is a marked improvement over Porubcan which discloses a maximum Viable Count of $107 \cdot 10^{8}$/g (Column 6, Table III).

Additionally, pages 25-29 of applicants specification disclose powder concentrate

of $2.84 \cdot 10^{11}$ cfu/g of dry matter (page 25, line 2) to $8.76 \cdot 10^{11}$ cfu/g of dry matter (page 27, line 23). Moreover, the compressed products are also mechanically stable. As disclosed in Figure 1, obtaining a content of abraded material of less than 20% illustrates sufficient mechanical stability in order to avoid dust formation. As evidence by the marked increase in colony forming unit and increase stability of the compressed product, one of ordinary skill in the art would not expect that the compression of the microorganism material would result in such increase in the colony forming unit.

As a result of the compression of the microorganism containing material, high density is achieved and the ingress of air and moisture into the dry preparations according to the invention is significantly decreased in such a manner that a considerable improvement in the stability of the invention. (Page 4, lines 44-47). The present invention includes controlling the humidity of the dried products that may or may not be compressed. Thus incorporating the dry gas including a dew point of less than about +5°C and optionally performing an additional drying step of claims 27 and 28 result in the residual humidity being significantly reduced resulting in a dried product of improved storage stability.

The criticalness of controlling the humidity of the powder concentrate can be seen as evidenced in Tables C and D. As can be seen in Table C, a powder concentrate with residual humidity of powder percent of 2.2% undergoes a 39% loss after 4 weeks of storage. In contrast, a powder concentrate that contains 3.4% humidity of the powder undergoes 86% loss after 4 weeks of storage. Thus, it is clear

that the humidity of the powder results in loss of colony forming units during storage.

As a result of controlling the humidity during processing, the stability on storage of the product is greatly increased. Evidence in support of this can be found in the specification on pages 25-29 in applicants example. For instance, example S1 (page 25, lines 11-17) results in 100% of the retention of the dry matter after 30 days. Additionally, in example S2, 86% of the cfu was retained after 30 days. (Page 26, lines 5-9). As a result of the unexpected improvement of applicants invention, it would not be obvious to one of ordinary skill in the art to produce applicants invention. As a result of the above remarks applicants respectfully request the rejection be withdrawn and the application passed to issue.

A check in the amount of $920.00 is attached to cover the required three month extension fee.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees to Deposit Account No. 11-0345. Please credit any excess fees to such deposit account.

Respectfully submitted,
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Attachments: Tables A-D, Figs. 1-3

Table A

Exp. No.	Hz 63/98	Hz 71/98	Hz 72/98	Hz 76/98
	Amount g	Amount g	Amount g	Amount g
Culture	2500	20000	2500	2945
Avicel PH 102	500	4000	400	500
Ascorbic Acid	925	7400	925	600
Na-Bicarbonate	920	7360	920	600
Sipernat 22 S	75	600	75	75
Leucin	75	600	75	75
Uranin	5	40	5	5
PEG 4000			100	
Total	5000	40000	5000	4800

Table B

Exp. No.	Initial cfu 10^11/g	Linear force kN/cm	Compressed product cfu 10^11/g	Survival rate %	Abraded material %
Hz 63/98	1,55	6,4	1,11	72	18
		10,2	0,94	61	13
		14,5	0,7	45	8
Hz 71/98	1,53	6	0,96	63	19,4
		13,6	0,71	46	7,6
Hz 72/98	1,47	6,4	1,03	70	18,1
		9,3	0,92	63	3,7
Hz 76/98	1,63	5,7	1,17	72	11,6
		10	0,99	61	9,2

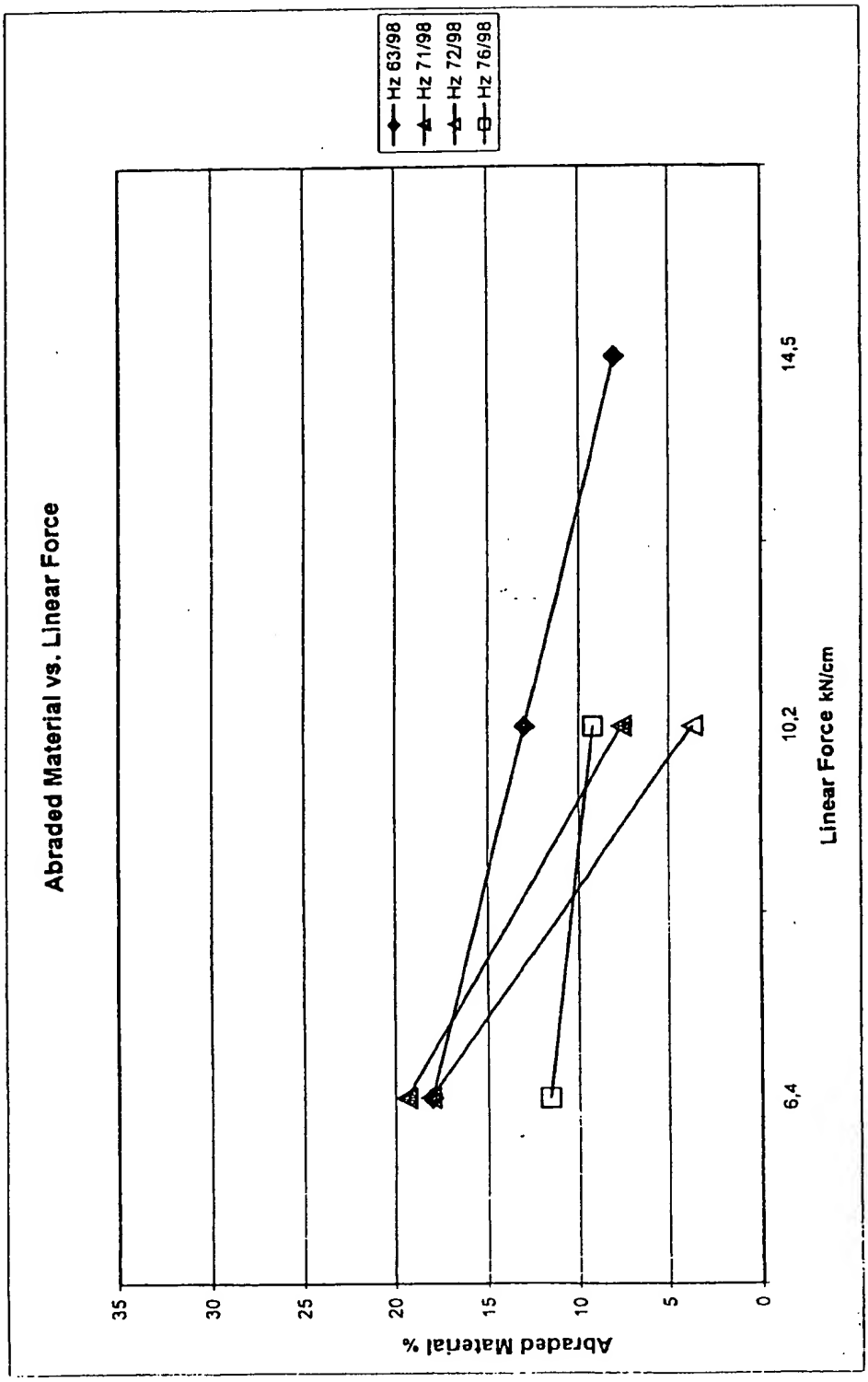
Abraded Material vs. Linear Force
Hz 63/98
Hz 71/98
Hz 72/98
Hz 76/98
Abraded Material %
35
30
25
20
15
10
5
0
Linear Force kN/cm
14,5
10,2
6,4

Fig.1

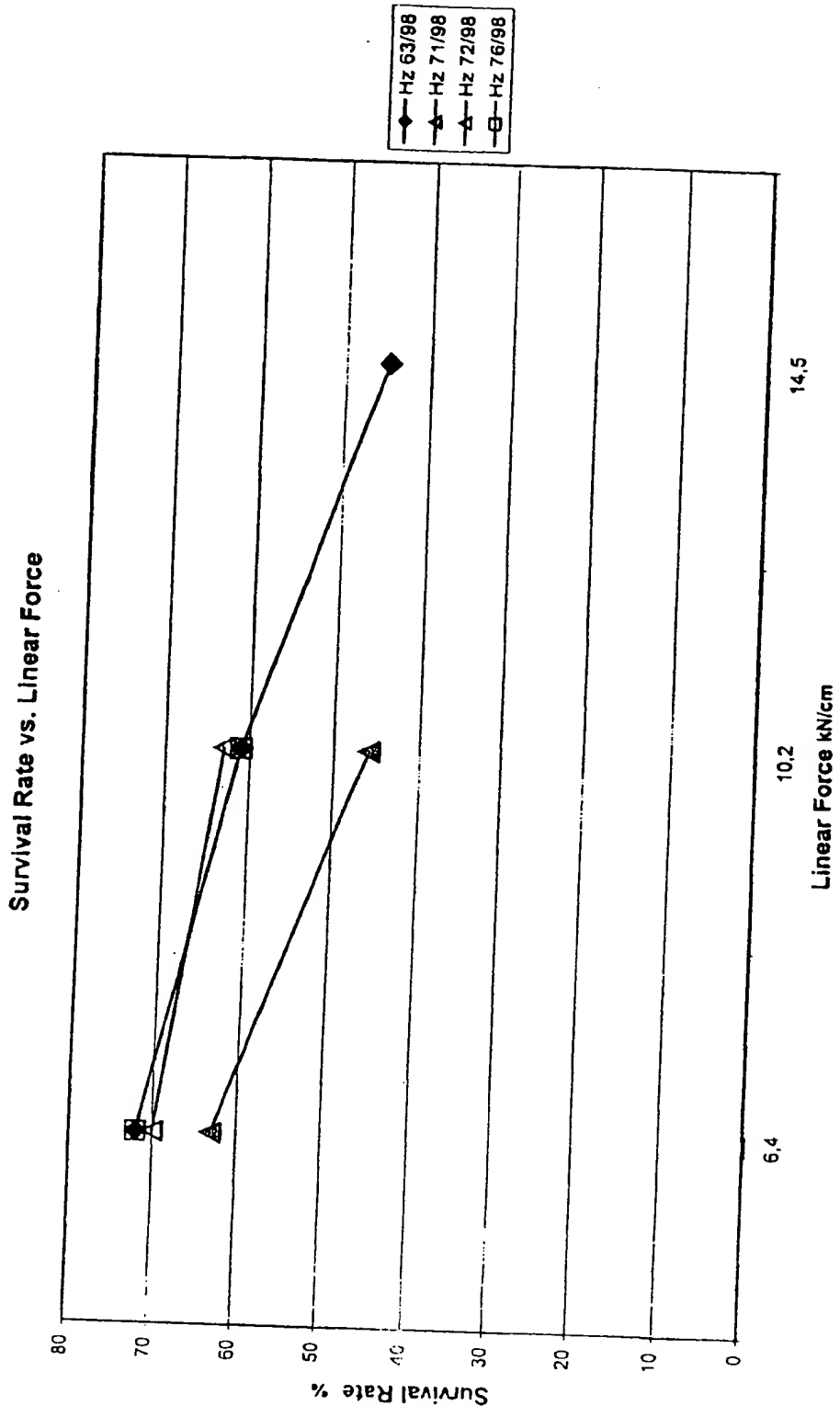
Hz 63/98
Hz 71/98
Hz 72/98
Hz 76/98
Survival Rate vs. Linear Force
Survival Rate %
80
70
60
50
40
30
20
10
0
Linear Force kN/cm
14,5
10,2
6,4

Fig.2

Fig.3

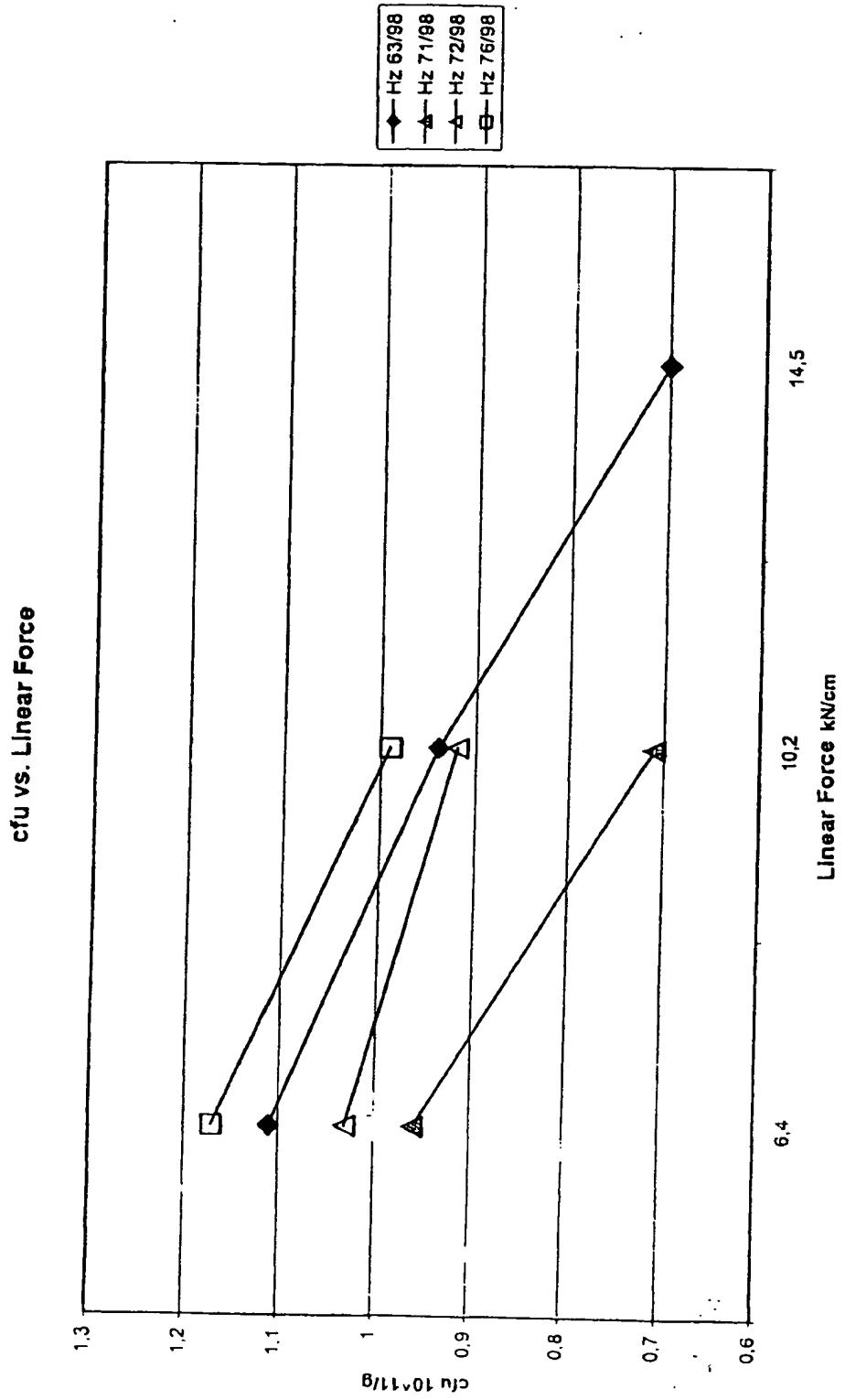
Hz 63/98
Hz 71/98
Hz 72/98
Hz 76/98
cfu vs. Linear Force
cfu 10^11/g
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
Linear Force kN/cm
14,5
10,2
6,4

Table C

Residual Humidity of Spray-dried Powder and Storage Stability

Initial Value cfu/g - 10^{10}	After 4 Weeks Storage cfu/g - 10^{10}	Loss %	Residual Humidity of Powder %
36	5	86	3,4
34,5	8,5	75	3,2
31	10,5	66	2,9
30	13	57	2,6
28	13	54	2,5
27	16,5	39	2,2
27	16,5	39	2,2

Table D

Residual Humidity of Spray-dried Powder

Residual Humidity	Water Activity
1,7	0,051
2,8	0,096
2,8	0,096
3	0,081
3,6	0,13
3,7	0,102
4,3	0,211
4,8	0,224
4,9	0,231
5,8	0,248
6,3	0,277
6,5	0,317

VERSION WITH MARKINGS TO SHOW CHANGES MADE

Amend claims 19, 27, 30, 34-37 and add new claims 38-39 as follows:

19. (amended) A dry microorganism culture which comprises at least one microorganism species in carrier-bound form, wherein the culture is present in the form of particles which

a) have a particle size of at least about 0.1 mm and

b) comprise from about [10^8] $\underline{10^{10}}$ to 10^{12} cfu/g of at least one microorganism species; and

c) are compressed.

27. (amended) A process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-drying use being made of a conditioned dried gas having a dew point of less than about [+50°C] $\underline{+5°C}$, heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray dryer, this dried material having an exit temperature of from about 45 to 75°C.

30. (amended) Dry compressed microorganism culture according to claim 19, obtained from a powder concentrate of microorganism culture dried in a spray-dryer, for the spray-drying use being made of a conditioned dried gas having a dew point of less

than about [+50°C] +5°C , heated to a temperature in the range of above about 80°C.

34. (Amended) A process as claimed in claim 31, wherein the spray-drying is performed in a spray-dryer in which a conditioned dried gas is employed having a dew point of less than about [+50°C] +5°C , heated to a temperature in the range of above about 80°C.

35. (amended) A starter culture for foodstuffs and feedstuffs comprising a microorganism culture as claimed in claim 19, or prepared by a process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-drying use being made of a conditioned dried gas having a dew point of less than about [+50°C] +5°C , heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray dryer, this dried material having an exit temperature of from about 45 to 75°C.

36. (Amended) A foodstuff or feedstuff obtainable by using a microorganism culture as claimed in claim 19 or prepared by a process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a

liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-dryer use being made of a conditioned dried gas having a dew point of less than about [+50°C] <u>+5°C</u>, heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray-dryer, this dried material having an exit temperature of from about 45 to 75°C.

37. (amended) A process as claimed in claim 33, wherein the spray-drying is performed in a spray-dryer employing a conditioned dried gas having a dew point of less than about [+50°C] <u>+5°C</u>, heated to a temperature in the range of above about 80°C.

38. (New) A powder concentrate of a microorganism culture comprising from about 4×10^{11} to 10^{12} cfu/g of at least one microorganism species.

39. (New) The powder concentrate of claim 38 having a water activity a_w of less than 0.4.

COPY OF ALL CLAIMS

19. (amended) A dry microorganism culture which comprises at least one microorganism species in carrier-bound form, wherein the culture is present in the form of particles which

a) have a particle size of at least about 0.1 mm and

b) comprise from about 10^{10} to 10^{12} cfu/g of at least one microorganism species; and

c) are compressed.

20. A microorganism culture as claimed in claim 19, wherein the particles have been compressed under the action of a linear force from about 5 to 15 kN/cm or a pressure from about 90 to 160 MPa.

21. A microorganism culture as claimed in claim 19, wherein the compressed particles comprise compacted broken material having a diameter of from about 0.1 mm to about 2 mm.

22. A microorganism culture as claimed in claim 19, wherein the compressed particles comprise tablets having a diameter of from about 2 to 50 mm and a ratio of diameter to thickness of from about 1:0.1 to about 10:1.

23. A microorganism culture as claimed in claim 19, wherein it comprises, a further component, an effervescent additive.

24. A microorganism culture as claimed in claim 19, wherein, as carrier, it comprises at least one matrix material for embedding the microorganism cells with or

without at least one further cell-stabilizing additive.

25. A microorganism culture as claimed in claim 19, wherein it comprises at least one lactic-acid-producing bacterial species.

26. A microorganism culture as claimed in claim 25, wherein the bacterial species is selected from bacteria of the genus Lactobacillus sp.

27. (amended) A process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-drying use being made of a conditioned dried gas having a dew point of less than about +5°C, heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray dryer, this dried material having an exit temperature of from about 45 to 75°C.

28. A process as claimed in claim 27, wherein, in a further stage d), the dry material is subjected to a further drying at a temperature in the range from about 15 to 50° C in a gas atmosphere or in vacuo and/or at least one desiccant is added.

29. A process as claimed in claim 27, wherein, as dry material, a powder concentrate having a content of viable microorganisms of from about $5 \cdot 10^8$ to $1 \cdot 10^{12}$ cfu/g is obtained.

performed in a spray-dryer in which a conditioned dried gas is employed having a dew point of less than about +5°C , heated to a temperature in the range of above about 80°C.

35. (amended) A starter culture for foodstuffs and feedstuffs comprising a microorganism culture as claimed in claim 19, or prepared by a process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-drying use being made of a conditioned dried gas having a dew point of less than about +5°C, heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray dryer, this dried material having an exit temperature of from about 45 to 75°C.

36. (amended) A foodstuff or feedstuff obtainable by using a microorganism culture as claimed in claim 19 or prepared by a process for producing a dry microorganism culture, comprising at least one microorganism species in carrier-bound form, which comprises

a) dissolving or suspending at least one substance suitable for forming a carrier in a liquid comprising at least one microorganism species,

b) drying the resultant mixture in a spray-dryer, for the spray-dryer use being made

of a conditioned dried gas having a dew point of less than about +5°C, heated to a temperature in the range of above about 80°C, and

c) removing the dried material from the spray-dryer, this dried material having an exit temperature of from about 45 to 75°C.

37. (amended) A process as claimed in claim 33, wherein the spray-drying is performed in a spray-dryer employing a conditioned dried gas having a dew point of less than about +5°C, heated to a temperature in the range of above about 80°C.

38. (New) A powder concentrate of a microorganism culture comprising from about 4×10^{11} to 10^{12} cfu/g of at least one microorganism species.

39. (New) The powder concentrate of claim 38 having a water activity a_w of less than 0.4.

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